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Abstract of bachelor's thesis

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Abstract

Empirical research in Finance and Corporate Governance has seen various factors introduced for tracking the monitoring and advising capability of the board of directors. It is also widely agreed that the CEO and board member age are relevant factors that determine the behavior of an individual in a corporate world. The former literature on CEO and board characteristics concentrates mostly on the separate effects, not the relation between these two. Still, the studies on these two variables provide arguments that age matters, therefore encouraging me to examine the relation between these two.

In this paper, I look at the U.S. Data from years 1998 to 2016 to determine if there is a relationship between the share of younger-than-CEO members in a board of directors and firm performance as well as CEO Compensation. The data used in the paper generates from ISS for the board variables, Execucomp for CEO compensation and CSRP and Compustat for the financial and market information of the sample firms.

I estimate a linear regression with industry and year-fixed effects with relevant controls based on the previous literature on board composition factors. Part 1 of the paper will introduce the reader to the topic and former literature in the field, part 2 to the initial hypotheses, data and methods and the parts 3-6 will show the regression results and discuss them.

I find statistically significant relation between the total CEO compensation and the cash intensity of the compensation. However, based on this sample, no statistically significant evidence on the firm performance can be found.

Keywords Corporate governance, Board of directors, CEO age, Director age

Younger than the CEO in the boardroom – does it matter? Empirical evidence on firm performance and CEO Compensation

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Abstract

Empirical research in Finance and Corporate Governance has seen various factors introduced for tracking the monitoring and advising capability of the board of directors. It is also widely agreed that the CEO and board member age are relevant factors that determine the behavior of an individual in a corporate world. This paper acknowledges these factors and adds a new aspect to the debate by measuring the effect of the share of younger-than-CEO board members in a board. I study the relation with firm performance and CEO compensation with U.S. firms between 1998-2016 and find statistically significant negative effect on the total level of compensation and positive effect on the cash intensity of the compensation.

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1.1 Introduction

Debate over the correct Board structure has usually been centered around board size, director ownership and independence. The average age of directors and executives have been rising and this also creates a need for studying possible implications resulting from it. As the figures (Figure 1 and Figure 2) below on page 4 show, there is an upward trend in share of younger than CEO -directors since 2010.

Age is a factor that affects the reputation, status and behavior in everyday situations and it is also possible that these socio-psychological patterns might affect decision making in corporate life. First and foremost, positive age difference for CEO might have consequences for the monitoring role of the board as thee directors might regard him as more experienced and therefore not interfering with CEO's decision making effectively. Secondly, the age dominance between CEO and directors could affect the board's role as an advisor for the CEO.

The former literature on CEO and board characteristics concentrates mostly on the separate effects of CEO age and board member age, not the relation between these two. The studies on these two variables provide arguments that age matters, therefore encouraging me to study the relation. In this paper, I look at U.S. data from years 1998 to 2016 to determine if there is a relationship between the share of younger-than-CEO members and firm performance as well as CEO Compensation.

I estimate a linear regression with industry and year-fixed effects with relevant controls based on the previous literature on board composition factors. Part 1 will introduce the reader to the topic and former literature in the field, part 2 to the initial hypotheses, data and methods and the parts 3-6 will show the regression results and discuss them. I find statistically significant negative relation between the total CEO compensation and positive relation between the cash intensity of the compensation. However, based on this sample, no statistically significant evidence on the firm performance can be found.

Figure 1: Development of CEO and average board member age, n=18163

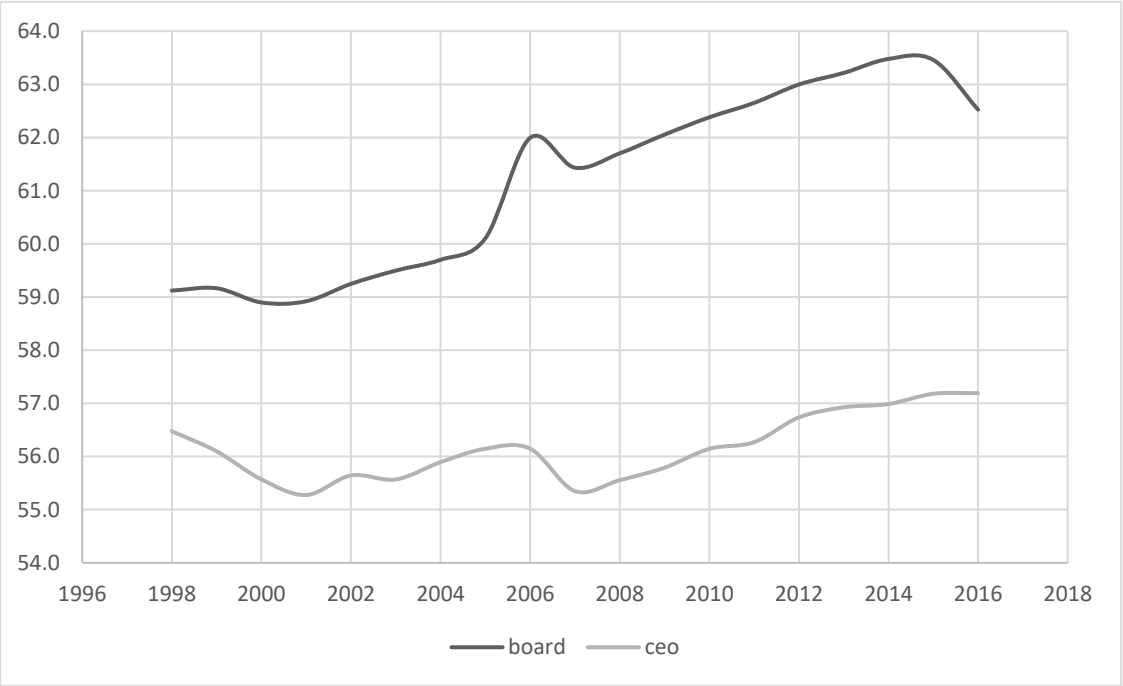
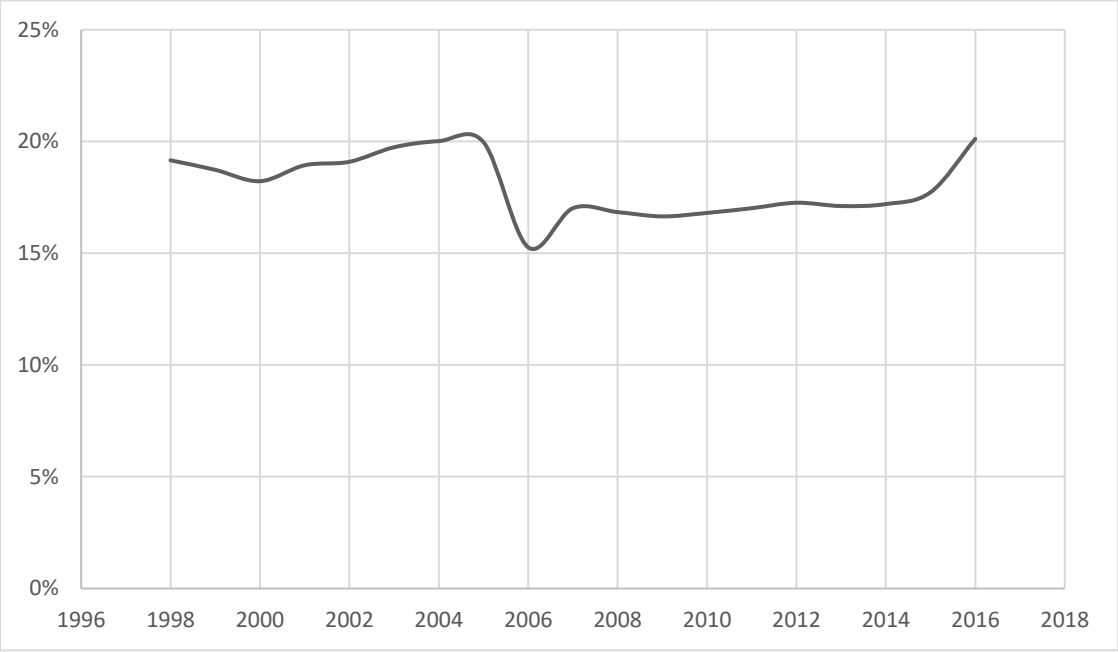


Figure 2: Development of Share of younger-than-CEO board members, n=18163



1.2 Literature review

The role of board of directors

The previous studies have identified two main roles for the board of directors. First, Board of directors functions as a controlling force, assuring the advantage of the shareholders. Fama (1980) and Fama

and Jensen (1983) view the board of directors, furthermore outside directors as experts in internal control, such as referees. Monitoring activities are closely related to executive compensation and agency problems. The monitoring role of the board is highlighted when the executive isn't compensated in an effective way and in the worst case, when the executive doesn't have an equity holding in the respective company at all (Fama and Jensen 1983).

The second role of the board is to act as an advisor for the CEO. The board members have valuable strategic insight in various issues through their experience in various tasks in corporate world and can help the CEO in different decisions. Researchers (e.g. Pye, 2002; Westphal, 1999; Zajac and Westphal, 1996, see Stevenson and Radin 2009) widely agree that well-functioning boards cannot be solely concentrated on tracking the CEO, as the board also can also help the CEO in assessing strategic questions. The strategic help is a practical view of what can the board achieve as an advisor. The advisory role of the board was already discussed Fama and Jensen (1983) in their study of the firm ownership and control.

Past studies have recognized different measures for the effectiveness of the monitoring role of the board. These measures focus on CEO structural power more than socio-psychological patterns. For example, independence of a director is a key factor in reviewing the effectiveness of his/her monitoring capabilities. A director is assumed to be independent if he or she isn't employed in the respective company or doesn't have close family ties to company employees. Rosenstein and Wyatt (1990) find positive impact on shareholder wealth when appointing outside directors as do Ryan and Wiggins (2004), implying that independence aligns CEO's and shareholder's preferences.

CEO Duality, defined as the situation where the CEO also functions as the chairman of the board, relates to better firm performance in the U.S. Market (Baliga, Moyer and Rao 1996), but latter papers have had mixed results, as for example Masulis et. Al (2016) find a negative relation in their paper, also with U.S. Data. Tuggle et Al. (2010) find evidence that Duality decreases monitoring by the board. The power of the CEO naturally increases due to holding both positions. Studies have shown it to increase riskiness of firm's risk-taking behavior, such as bankruptcy and variation in the stock market along with strengthening the bond between CEO overconfidence and firm's risk taking (Daily & Dalton, 1994; Hambrick & D'Aveni, 1992; Li and Tang 2010, see Lewellyn and Muller-Kahle 2012).

Board size is another structural measure, and studies have found out that bigger boards result in weaker monitoring (Lipton and Lorsch 1992; Jensen 1993). Also, board size has a negative correlation with Tobin's Q (Yermack 1996), which as an outcome variable also studied in this paper. Independent directors with long tenure provide CEO with expertise of the firm and hold similar capabilities as the CEO and therefore increase probability and capability to question CEO's decisions. Also studies have

shown that with shorter tenure, directors don't monitor managers as effectively in cases of financial fraud. (Kosnik, 1990; Beasley, 1996; Dechow, Sloan, & Sweeney, 1996; Dunn, 2004, see Lewellyn and Muller-Kahle 2012)

Independent (or outside) blockholder is defined as a director with at least 5% voting power without any inside ties or employment to the company (Denis et. al 1997). They found a significant rising probability of CEO turnover with companies having an independent blockholder. This is logical, as the independent blockholders have a high interest in the company due to large ownership, and without executive role are less tolerant of the incompetent leadership. However, the relation between independent blockholders and firm performance, as wide range of studies have had different results and many also insignificant ones. Still, it can be agreed that independent blockholders pose great power and can increase the control over the CEO (Holderness 2003).

Director ownership is the aggregate ownership that the board of directors pose. For example, Bhagat and Bolton (2013) find out in their recent study a significant positive correlation between Tobin's Q and director ownership. It is worth noting that relation has been found in various other studies as well, and it is easily explained by agency theory. With directors also having ownership, the management's and shareholders' intentions aligned.

One socio-psychological pattern between CEO and board members that gas been studied is "Co-option", meaning whether a board member has been appointed after or before CEO. Coles, Daniel and Naveen study the effects in their paper *Co-opted Boards* (2014) and find out that higher co-option (amount of board members appointed after CEO is related to higher investment, higher CEO pay and lower CEO pay-performance sensitivity. The Co-option as a measure is measure related to the variable studied in this paper, as the directors appointed directors are more likely to feel sympathy towards the CEO that has had an effect in appointing them. Co-option as a measure is a relevant reference as it tries to capture the invisible part of the CEO power, as it cannot be regarded as a structural factor in a similar way as the ownership and independence. Co-option in my opinion is more sympathy-measure, and the younger-than-CEO measure I study in this paper is more of a conflict measure.

Effects of age in corporate world

In the next part of this literature review I introduce to the reader to the relevance of age in a company decision making context, both in terms of CEO and board member ages. Serfing (2014) studies the CEO age in his paper *CEO age and riskiness of corporate policies.* He finds significant negative correlation with CEO age and stock volatility. He also finds evidence that younger CEOs outperform older CEOs by average. The paper also answers the question of if the age of second-most influential

executive affects CEOs risk-taking activities. Serfing creates four indicator variables on different age combinations: Young CEO & Young Executive, Young CEO & Old Executive and Old CEO & Old Executive. The CEOs' and second-most influential executives' median ages are used to divide the age groups. He finds out that the latter three variables lead to lower volatility compared to first. Yim (2013) studies CEO age and acquisition behavior. Yim finds that CEO age is negatively correlated with acquisition activity, largely because of big, permanent increases in CEO compensation. Jenter and Lewellen (2015) find rising probability of successful takeover bid when moving towards CEO age of 65, caused by the lower CEO private costs from the takeover. Additionally, Murphy and Zimmerman (1993) find a positive correlation with CEO age and CEO turnovers. Based on these studies, it seems that the age of the CEO is important consideration when considering the riskiness of the decisions, as the outcomes have different consequences a

Other CEO characteristics are not conceptually important to go into detail but will be listed here, because they will still be used as control variables. Hill and Phan (1991) find evidence that CEO pay is positively correlated with CEO tenure and that tenure reinforces the relation between firm size and CEO compensation. Coles et. Al (2006) use CEO portfolio delta and vega as control variable in their paper *Managerial incentives and risk-taking* and Serfing uses the same methodology in his paper. Coles et. Al find that higher CEO delta and CEO vega are related to higher firm risk, meaning that the higher sensitivity of the CEOs compensation leads to riskier investment which might have either positive or negative outcomes based on the controlling capability of the board.

A recent study regarding age is *Older and Wiser, or Too Old to Govern* by Masulis, Wang, Xie and Zhang (2016), which examines the effects of amount of over 64-year old individual directors in board. They find negative relation with performance and share of older directors, and positive correlation with higher cash intensity in CEO compensation. Overall, they argue that higher board member age leads to poorer firm governance in various measures. According to them, the reason is the retirement-age, as usually at this point the bad performance doesn't harm the career prospects in the same way as earlier in the career. For the purposes of this paper, I find this measure irrelevant, as I don't measure the inefficiency of the older directors. Masulis et. Al (2016) state in their paper that former studies with mean or median based variables have had weak or mixed results but decided to use the board median age as the control variable for filtering the younger-than-CEO variable, as I believe that it covers the age-related characteristics on a wider scale than the dummy variable.

Anderson et. Al (2011) have a social board heterogeneity variable that also contains the age diversity of a board (measured with board age variance). They find positive correlation between social heterogeneity and firm performance, measured with Tobin's Q and EVA (Economic Value Added).

Their view is that older board members can provide experience and young members less risk aversion. The results from Anderson et. Al are encouraging, as it shows that age related measures from the group have statistically significant effects for firm performance.

Status in groups

It is widely agreed that age is a factor that affects person's credibility and social status in groups and decision making. It was already shown over 60 years ago, in Bales' papers (Bales 1950, 1953; Bales et al 1951; Bales & Slater 1955; Heinecke & Bales 1953; see Berger, Rosenholtz, Zeldlitch 1980). In his studies, test groups were of equal status to begin with, and age among other demographic factors created sustainable power-prestige and inequalities within decision making groups. Key difference is to the empirical research in corporate finance is that the groups were artificial whereas in a corporate setting the decision-making groups are hardly ever made completely from scratch.

Belliveau et al. (1996) studied CEO compensation and CEO social similarity and social status. Social similarity was measured with for example same graduation school and same former employer between CEO and compensation committee chairman. Social status index was calculated using board memberships, social club memberships and memberships in other institutions. They found significant correlation between CEO compensation and social status.

Combining the insights from these papers we can hypothesize a model that channels first the age superiority to the social capital of the CEO, which then channels into performance and compensation. This paper contributes in acknowledging the former studies of the age-based power inequalities in decision making groups and testing them empirically in a corporate context rather than in an experimental psychological study. I use the relevant control factors from the former papers on board structure, but rather than focusing on the agents' personal interests (risk aversion, ownership etc.), I seek to find out whether the unobservable incentives and behavioral patterns related to age have any impact on the used measures.

2.1 Hypothesis Development

I have two alternative hypotheses for the effect on Firm performance, and they are denoted with letters a and b. As suggested in the previous hypotheses, the possible lesser control of CEO resulting from age superiority could have a negative effect on firm performance. Firm performance will be measured as industry adjusted Return on assets and Tobin's Q.

HYPOTHESIS 1a: Firm performance decreases with the fraction of younger-than-CEO board members.

Lewellyn and Muller-Kahle (2012) find evidence in subprime lending industry, that CEO power measured as Duality, Board independence, CEO ownership and Tenure result in higher risky behavior. They define CEO power prestige as "commanding position in people's minds". They measure the prestige as the number outside directorates (enhancing CEO reputation). They only find positive correlation between risky behavior and power prestige at 10% significance level. Even though the significance level is low, it is possible that age superiority creates bigger power prestige as the number of outside directorates. If we assume that the higher CEO power will result in increased easiness of pursuing positive NPV projects, also a positive coefficient could be explained. This would then mean that on average, the studied firms should not be suffering from significant agency problems between the owners and the CEO.

HYPOTHESIS 1b: Firm performance increases with the fraction of younger-than-CEO board members.

As the literature on social status suggests, status influences the CEO Compensation, and as age is a driver in social status, I predict the age superiority to influence the CEO total compensation and Cash intensity. Connecting the studies on social patterns emerging in the groups and past study on the effect of social status on CEO pay, I can hypothesize share of younger-than-CEO to be associated with higher total compensation. The Masulis et. Al. (2016) paper showed significant correlation with older than 64 – directors and cash intensity, which further suggests that age might have an effect as a dual measure as well (comparison of CEO Age and Board median age). I further predict the CEO age superiority to have similar effects as Co-option, which also was found to result in higher CEO Compensation (Coles et. Al 2014). This is because social status is also bigger for CEO with more co-opted board members. With higher social status and therefore power, I hypothesize the CEO to have a more favorable compensation in personal context e.g. higher total compensation and less uncertainty (higher cash intensity).

HYPOTHESIS 2: Fraction of younger-than-CEO board members is positively correlated with CEO Total Compensation.

HYPOTHESIS 3: Fraction of younger-than-CEO board members is positively correlated with Cash intensity of CEO Compensation.

HYPOTHESIS 4: Fraction of younger-than-CEO board members is negatively correlated with Equity intensity of CEO Compensation.

2.2 Sample construction

The service used in data collection is the Wharton research data services (WRDS). The board member and CEO data for this study originates from ISS (Institutional shareholder's services) and Compustat. Additionally, sub-dataset of Compustat, Execucomp is used for CEO information.

The sample period is the years 1998-2016 (I follow the methodology used by Masulis et. Al. 2016 as they exclude years before 1998 based on the fact that most of the companies miss some important information, such as director shareholdings and board seat information). The company universe in the sample includes all the companies found in ISS. The CEO data is downloaded from Execucomp, using the full universe of US companies and executives in the respective timeframe.

After acquiring the director data from ISS, it is matched with Execucomp data with ticker and year. Then, relevant calculations between these two are made. All observations without a match are deleted from the sample. The financial variables needed in the regressions are calculated from the Compustat and CRSP data and added to the dataset. Finally, all rows missing financial or director information are deleted.

2.3 Methodology

I estimate an OLS linear regression model with both industry and year fixed effects, using R-projects fixed effects linear model -function. Industry codes used in fixed effects are of NAICS-format. I clustered the standard errors instead of using normal standard errors as according to Abadie et. Al (2017) it is a common research practice in the economic context. However, the statistical significance of the results on younger-than-CEO variable presented later are similar with both specifications. Only the results with clustered standard errors are presented.

Variable definitions and statistics are further specified in table 7 in Appendix, but I will go through some of the methods for acquiring different control variables. For checking the duality, I conduct an if-test whether the surname of the chairman matches the surname of the CEO for the respective year. For total compensation, I follow the methods of former literature as I use the natural logarithm of the total compensation. There were two alternatives for measuring Director ownership based on former literature: using the aggregate proportion in terms of total shares outstanding, or the aggregate value of director shareholdings. Arguments can be made for both of the measures, but as Masulis et. Al

(2016) used the total proportion in their study related to Director age, I decided to follow that methodology.

3. Regression tables and summary statistics

Table 1

Summary statistics of the variables

Variable	N	Mean	SD
ROA	18,163	0.134	0.101
Q	18,163	1.384	1.410
Total compensation	18,163	8.175	1.193
Equity Intensity	18,163	0.352	0.534
Cash Intensity	18,163	0.344	0.259
Younger-than-CEO	18,163	0.263	0.245
Board median age	18,163	61.600	4.693
Ceo age	18,163	55.092	10.386
Ceo tenure	18,163	7.281	7.714
Log market cap	18,163	7.843	1.569
RND	18,163	0.025	0.049
Stock return	18,163	0.108	0.633
Volatility	18,163	0.130	1.387
Board size	18,163	9.360	2.442
Independence	18,163	0.746	0.150
Director ownership	18,163	8.132	18.432
Duality	18,163	0.428	0.495
Busy board	18,163	0.073	0.102
Indep. Blockholder	18,163	0.042	0.200
Indep. director tenure	18,163	0.108	0.127
Co-option	18,163	0.366	0.301

This table represents the summary statistics of the variables used in the following regressions. *N* denotes the number of observations and *SD* standard deviation. Definitions and sources for the variables can be found in the appendix.

Table 2
Regression on ROA

Coefficients:	Estimate	Cluster s.e.
Younger-than-CEO	0.007	0.009
	(0.816)	
Board median age	0.000	0.000
	(-0.676)	
Ceo age	0.000	0.000
	(0.557)	
Ceo tenure	0.000	0.000
	(1.197)	
RND	-0.379**	0.145
	(-2.622)	
Log marketcap	0.023***	0.002
	(10.68)	
Stock return	0.003	0.003
	(1.188)	
Volatility	-0.003***	0.000
	(-7.494)	
Board size	-0.006***	0.001
	(-5.678)	
Independence	-0.015	0.011
	(-1.316)	
Director ownership	0.000	0.000
	(-1.741)	
Duality	-0.01***	0.002
	(-4.125)	
Busy board	-0.052**	0.016
	(-3.276)	
Indep. Blockholder	0.003	0.010
	(0.305)	
Indep. Director tenure	0.023**	0.009
	(2.587)	
Co-option	-0.002	0.006
	(-0.383)	
N	18163	
Adjusted R-squared	0.3780	

This table reports the OLS-regression statistics from the regression on *ROA,* including firm and year fixed effects and using clustered standard errors. The table reports the estimated coefficients on the first row for each variable, and the t-stat on the second row. The respective significance levels are *=0.05 **=0.01 and ***=0.001.

Table 3
Regression on Tobin's Q

Coefficients:	Estimate	Cluster s.e.
Younger-than-CEO	0.002	0.110
	(0.022)	
Board median age	-0.016*	0.007
	(-2.202)	
CEO age	-0.002	0.002
	(-0.854)	
CEO tenure	0.012**	0.004
	(2.976)	
RND	5.285***	1.290
	(4.098)	
Log marketcap	0.371***	0.056
	(6.629)	
Stock return	0.146.	0.080
	(1.834)	
Volatility	-0.01***	0.002
	(-5.886)	
Board size	-0.136***	0.022
	(-6.25)	
Independence	-0.619***	0.163
	(-3.787)	
Director ownership	-0.002	0.001
	(-1.719)	
Duality	-0.113**	0.038
	(-2.951)	
Busy board	-0.938***	0.161
	(-5.837)	
Indep. Blockholder	0.281***	0.083
	(3.389)	
Indep. Director tenure	0.2850	0.161
	(1.778)	
Co-option	-0.019	0.088
	(-0.211)	
N	18163	
Adjusted R-squared	0.425	

This table reports the OLS-regression statistics from the regression on *Tobin's Q,* including firm and year fixed effects and using clustered standard errors. The table reports the estimated coefficients on the first row for each variable, and the t-stat on the second row. The respective significance levels are *=0.05 **=0.01 and ***=0.001.

Table 4
Regression on Total CEO compensation

Coefficients:	Estimate	Cluster s.e.
Younger-than-CEO	-0.200*	0.0920
	(-2.19)	
Board median age	-0.002	0.0040
	(-0.571)	
CEO age	0.004*	0.0020
	(2.076)	
CEO tenure	-0.01	0.0070
	(-1.495)	
ROA	-0.088	0.1740
	(-0.503)	
Q	-0.052*	0.0230
	(-2.253)	
RND	0.725	0.5150
	(1.407)	
Log Market cap	0.380***	0.0340
	(11.067)	
Stock return	-0.016	0.0190
	(-0.845)	
Volatility	-0.01**	0.0030
	(-3.213)	
Board size	0.021*	0.0100
	(2.025)	
Independence	0.498**	0.1570
	(3.166)	
Director ownership	-0.004*	0.0020
	(-2.342)	
Duality	0.057	0.0390
	(1.463)	
Busy board	0.514***	0.1400
	(3.664)	
Indep. Blockholder	-0.035	0.0550
	(-0.644)	
Indep. Director tenure	-0.019	0.141
	(-0.137)	
Co-option	0.310**	0.120
	(2.58)	
N	18163	
Adjusted R-squared	0.432	

This table reports the OLS-regression statistics from the regression on *Log total CEO compensation,* including firm and year fixed effects and using clustered standard errors. The table reports the estimated coefficients on the first row for each variable, and the t-stat on the second row. The respective significance levels are *=0.05 **=0.01 and ***=0.001.

Table 5
Regression on Cash intensity of compensation

Coefficients:	Estimate	Cluster s.e.
Younger-than-CEO	0.058**	0.021
	(2.707)	
Board median age	0.002*	0.001
	(2.559)	
CEO age	0	0.000
	(-0.193)	
CEO tenure	0.003***	0.001
	(3.823)	
ROA	0.094*	0.047
	(1.973)	
Q	0.002	0.004
	(0.457)	
RND	-0.28**	0.098
	(-2.854)	
Log Market cap	-0.054***	0.005
	(-11.892)	
Stock return	0.004	0.005
	(0.913)	
Volatility	0.002***	0.000
	(5.525)	
Board size	-0.001	0.001
	(-0.495)	
Independence	-0.167***	0.024
	(-6.823)	
Director ownership	0.001**	0.000
	(3.239)	
Duality	-0.012*	0.006
	(-2.202)	
Busy board	-0.052**	0.020
	(-2.637)	
Indep. Blockholder	0.036*	0.014
	(2.571)	
Indep. Director tenure	0.033	0.022
	(1.465)	
Co-option	-0.029	0.016
	(-1.848)	
N	18163	
Adjusted R-squared	0.401	

This table reports the OLS-regression statistics from the regression on *Cash intensity of CEO compensation,* including firm and year fixed effects and using clustered standard errors. The table reports the estimated coefficients on the first row for each variable, and the t-stat on the second row. The respective significance levels are *=0.05 **=0.01 and ***=0.001.

Table 6

Regression on Equity intensity of compensation

Coefficients:	Estimate	Cluster s.e.
Younger-than-CEO	-0.009	0.036
	(-0.247)	
Board median age	-0.002	0.002
	(-0.848)	
CEO age	0	0.001
	(-0.493)	
CEO tenure	-0.002	0.002
	(-1.252)	
ROA	-0.108	0.116
	(-0.928)	
Q	-0.001	0.004
	(-0.145)	
RND	0.347	0.225
	(1.54)	
Log Market cap	0.021**	0.007
	(3.095)	
Stock return	-0.011	0.007
	(-1.519)	
Volatility	-0.001	0.000
	(-1.542)	
Board size	0.002	0.002
	(1.037)	
Independence	0.067	0.048
	(1.387)	
Director ownership	0.000	0.001
	(-0.497)	
Duality	-0.014	0.014
	(-1.03)	
Busy board	0.043	0.036
	(1.196)	
Indep. Blockholder	-0.027	0.018
	(-1.503)	
Indep. Director tenure	-0.080	0.046
	(-1.748)	
Co-option	0.005	0.022
	(0.242)	
N	18163	
Adjusted R-squared	0.265	

This table reports the OLS-regression statistics from the regression on *Equity intensity of CEO compensation,* including firm and year fixed effects and using clustered standard errors. The table reports the estimated coefficients on the first row for each variable, and the t-stat on the second row. The respective significance levels are *=0.05 **=0.01 and ***=0.001.

4. Analysis of the regression results

As seen from the tables 2 and 3, I don't find statistically significant effect from the younger-than-CEO variable on neither ROA nor Tobin's Q. The estimated coefficient is positive for both measures, which would imply that the initial hypothesis 1b (Firm performance increases with the fraction of younger-than-CEO board members) would have been most likely the correct one in case of statistically significant results. New studies with higher sample size would be needed to confirm the initial hypothesis, and based on the small t-value, it would take more than a few years.

The steps I introduced in this paper could be applied to geographies with high power distances, but it is unlikely that the data is as sufficient as in the U.S. Possible way of finding significant evidence could be other model specifications - instead of calculating the share of younger-than-CEO, other measures could be introduced. Adding or subtracting control variables could potentially have an effect, but based on the adjusted R-squared, both regressions (Table 2 and Table 3) seem to work relatively well (corresponding adjusted R-squared values 0,378 and 0,425). The values are in line with the former literature, which implies that the choice of measure and controls are at least not completely wrongly chosen.

Looking at the results on CEO compensation measures (tables 4, 5 and 6) there is significant negative coefficient of share of younger-than-CEO directors at 5% level for the total compensation. The estimated coefficient in the total compensation is ~-0.2, which means that the logarithm of the total compensation would go down with 0.2 when moving from 0 to 100% younger than CEO board members. The corresponding coefficient for cash intensity is ~0.058, meaning that the Cash intensity would go up 5.8 percentage points in a 0-100% change.

This is interesting as the prediction for the total compensation was the opposite. One reason for the lower total compensation might be the significant coefficient of higher proportion of the cash compensation: the high equity-based earnings probably are the base for highest CEO compensations. However, the coefficient for the share of equity compensation is insignificant, although negative. The adjusted R-squared for the Equity-intensity is by far the lowest from the compensation variables, which indicates that there might be some important variables missing. Masulis et. Al (2016) also find the similar differences in their regressions, as the R-squared is also significantly smaller for the equity-intensity regressions. One reason for the low R-squared might be that the pay structure negotiations can often be a complicated process which has a lot to do with personal traits of the negotiators which cannot be covered easily with control variables.

Even without statistical significance on the result of firm performance, my findings suggest that firms with boards with the higher share of younger-than-CEO board members are likely to have smaller total

CEO compensation without any confirmed negative effect on firm performance. The positive coefficient of firm performance suggests that with bigger sample we might see significant evidence about a positive effect on the performance as well.

The result on the cash intensity is an important consideration when assessing the implications of the results. When constructing the board with a lot of younger-than-CEO members, it does not automatically mean a cost reduction, as with higher cash intensity it might risk the CEO's incentives. However, as said, there is no clear connection to performance from the sample of this paper.

Overall the results suggest that the increase in the "younger-than-CEO" variable value might have positive consequences for the firm performance, but part of it could be offset by the less optimal compensation structure suggested by the regression results from CEO compensation. This contributes to the former literature in proofing and extending the relevance of age and further encourages the firms to look at the board member and CEO characteristics beyond the personality and personal incentives.

5. Limitations

As previous studies with the same exact scope don't exist, the biggest limitation is choosing the measurement of age superiority. Share of younger director's might not be the best measure, as it doesn't pick up the absolute differences between director and CEO ages. However, it is justified to use the share as for example Coles et. al use in their study *Co-opted boards (2014).* When controlling for the director ages, it can be argued that the Director age median isn't the best measure but at least it is less prone to the effect of one single old board member as in average age.

A limitation in this paper is the sample size. The main reason why the sample size is smaller compared to studies related to board structure is the fact that the data was a combination of separate datasets, e.g. many of the data points in ISS couldn't be matched from Execucomp. The ISS data contains some errors in director ages entering database after 2006, and errors were roughly between 1-3 years (recognized by Masulis et. Al. 2016). They point out that there is no systematic way to correct the ages and they had verified and corrected the director ages manually by looking at the original proxy statements for firms in ISS. This was unfortunately out of the scope for this study, and some errors in data exist. I assume the errors to be on both sides of the correct age as they don't mention otherwise, meaning that the errors would not be correlated with the measured variable nor the firm outcome variables. I also assume that none of the control variables were correlated with the measurement error of the director ages. Of course, the errors make the data more inaccurate and have weakened the significance of my results: with correct ages the coefficients for the firm performance might have been statistically significant.

When proofing duality, there is always a small chance that the names don't fully match in the two datasets, as there is a chance that that the surname is same for the CEO and director. In this case they they might not always be the same person, especially in family owned companies. I still expect this to be a very minor issue in the sample. Also, using the full name instead of surname could have resulted in even more inaccurate data as it is not clear how second and third names are reported in different datasets (ISS and Execucomp).

When calculating the director tenures and co-option, I was only able to obtain the appointment years, not appointment dates. This resulted in some inaccuracies as I wasn't able to identify the order of the CEO and director appointment when they were appointed in the same year. I decided to go forward with estimation of that only directors that had an appointment year later than CEO were co-opted. It is justified to assume that resulting measurement errors would not be correlated with any of the other measured variables.

The firms in my sample have naturally some differences in their financial reporting, more specifically in their fiscal years. I followed Masulis et. Al (2016) in my methodology and didn't make any corrections or adjustments regarding reporting standards.

6. Conclusion and motivation for further studies

In this paper I have conducted empirical research of younger-than-CEO share of total board members' effect on firm performance and CEO compensation. I find statistically significant evidence on negative effect on the total CEO compensation and positive effect on Cash intensity of the total CEO compensation. The estimated coefficients for the firm performance measures are positive, but not statistically significant in the sample. New studies from the topic could besides increasing sample size make subsets out of the data and test the same hypotheses for the firms with large share of younger-than-CEO board members.

Further studies in the topic could include analysis of the age variance added to the regressions and other specifications for the "younger-than-CEO" variable. Besides empirical research with quantitative methods, qualitative research methods such as interviews could provide more practical insight and examples of the measured phenomenon.

Another additional test that could be conducted in new studies is adding CEO delta and vega (stock price fluctuation sensitivity of value of holdings) to the regressions. When adding the delta and vega, there could be a more significant positive effect on the firm performance with the subsets of high delta and vega CEOs if the initial hypothesis of CEOs engaging in positive NPV projects is right.

For the effect on CEO compensation, additional analysis could be conducted for compensation committee composition that has the role in defining the compensation. With this we could see more significant effects when measuring the same ratio within the committee.

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Appendix

Table 7: Variable descriptions (after Masulis et. al 2016)

Variable	Description	Source
Firm characteristics		
ROA	Ratio of operating income before depreciation and amortization to total assets.	Compustat
Tobin's Q	Market value of company to book value of assets - ratio	Compustat
Log market cap	Natural log of Market value of equity.	Compustat
RND	Research and development expenses to sales -ratio.	Comustat
Volatility	Standard deviation of monthly returns in last 3 fiscal years	CSRP
CEO characteristics		
Total CEO compensation	Total compensation (incuding cash, bonus, equity and pension plans)	Execucomp
Cash intensity	Share of salary and bonus compensation of the total compensation	Execucomp
Equity intensity	Share of equity compensation of total compensation (Value of option and share grants to total compensation)	Execucomp
CEO age	CEO age reported in fiscal year (Data year – birth year)	Execucomp
CEO tenure	Difference between data year and CEO appointment year.	Execucomp
Governance characteristics		
Younger-than-CEO	Share of board members that are younger than CEO of the total board.	ISS
Board median age	Median of the director ages reported in the fiscal year.	ISS
Board size	Number of board members in the fiscal year.	ISS
Independence	Ratio of independent board members to board size. Independent board member is a board member without employment relationship in the company.	ISS
Director ownership	The aggregate percentage of shares owned by directors.	ISS
Duality	Indicator that is 1 if the CEO also serves as the chairman of the board and 0 otherwise. This comparison is made with a logical test, CEO is assumed the same person if the surname is the same as the surname of the chairman	ISS
Busy board	Share of directors that hold at least 3 board seats in ISS firms	ISS
Independent blockholder	Indicator equal to 1 if there is a independent blockholder sitting in the board, and 0 otherwise. Blockholder means a director with ownership of more than 5%.	ISS
Independent director tenure	Indicator that is 1 if there is a independent board member that has seated the board for more than 15 years.	ISS
Co-option	Share of board members that have been appointed after the CEO. Calculation is made with a logical test that is true if director appointment year is later than the CEO appointment year.	ISS